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REPORT OF THE ENGINEERS

OF THE

PHILADELPHIA AND READING RAILROAD COMPANY,

WITH

ACCOMPANYING DOCUMENTS,

AND

THE REPORT OF A COMMITTEE OF THE BOARD

TO WHOM THE SAME WERE REFERRED.

Printed by order of the Managers, September, 1838.

PHILADELPHIA—1838.

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REPORT.

At a meeting of the President and Managers of the Philadelphia and Reading Railroad Company, on the 19th of September, 1838, the following Report was presented, and referred to a committee for examination, with instructions to report to the Board whether the views and estimates presented in it are well founded, and, if so, to consider and recommend such further measures as may be proper to adopt, to insure the speedy and most beneficial completion of the whole work to Pottsville, which seems to promise the most satisfactory results.

To the President and Managers of the
Philadelphia and Reading Railroad Company.

GENTLEMEN:

We have the honour to submit to you the following report of the present condition of the work committed to our charge.

The railroad between Reading and Norristown, the board are aware, was opened for the conveyance of passengers on the 16th day of July last. The transportation on this part of the road has been since conducted with great regularity; two daily lines passing over it in each direction, accommodating the travel between Philadelphia and Reading and Pottsville, and to and from Harrisburg, by way of the Valley of the Schuylkill, and a considerable local travel created by the improvement. But little freight has as yet been transported on the road, and there will not, probably, be much other transportation than that of passengers, until the completion of the railroad between Norristown and Philadelphia. As soon as this can be effected, the receipts of the Company will, it is believed, be at least doubled by the

210246

transportation of lime, iron, agricultural products, and merchandise.

Arrangements have been made, in conformity with the instructions of the board, for the completion of the lower portion of the railroad, as early as it will be practicable to complete the Flat Rock Tunnel. The last named work, the board are aware, in consequence of the great elevation of the hill above it, can only be prosecuted to advantage from its two ends. The work, however, is progressing night and day, with the strongest force which can be employed on it, and no doubt is entertained of its entire completion by the first day of August next; and perhaps at an earlier date.

The board will be gratified to learn that the transportation on the railroad has so far been effected, to a great extent, with anthracite coal. Whilst it was never doubted that this fuel would be in all respects the most advisable, as it would be much the most economical, for the heavy description of engines contemplated for the accommodation of the coal trade, it was thought probable that difficulties might attend its use for the light passenger engines constructed for wood and coke, at first placed on the road. The result of our experience so far is to satisfy us that it may, with proper management, be used to a great extent, with any description of locomotive; and that it may be looked to as the exclusive fuel for that description of engine, which it will be most advisable to use on our road.

In compliance with the instructions of the board, at their meeting on the 7th of August, the heavy sections of the roadway formation, and a large proportion of the masonry on the continuation of the railroad above Reading, have been put under contract, to efficient and responsible parties, at satisfactory prices. The whole of the work contracted for may be expected to be completed in the course of the coming year. Should the financial position of the Company admit of the remainder of the work between Reading and Pottsville, and between the Schuylkill and the Delaware, being placed under contract by the 1st of March next, the whole work between the coal region and Philadelphia may be in readiness for the transportation of coal by the time at which the superstructure can be laid on the sections now under contract.

The annexed abstract, marked A, shows the whole amount hitherto expended on the railroad between Reading and the Delaware, including the branch to Philadelphia, and the remaining amount necessary to complete this portion of the railroad; and the estimates in the paper marked B, exhibit in detail the cost of constructing the railroad between Reading and the coal region, should it be decided to substitute two bridges in lieu of the tunnel in the neighbourhood of Port Clinton. On the plan originally contemplated at this point, and which the undersigned would yet decidedly prefer, an increased expenditure of from forty to fifty thousand dollars would probably be requisite.

The whole cost of constructing the railroad between Reading and Philadelphia and the Delaware, including the locomotive engines, cars, and carriages placed on and procured for it, it will be perceived, is two millions three hundred and seventy-six thousand three hundred and seven dollars ninety-four cents, and the amount for the construction of the railroad between Reading and the coal region, one million and seventy-seven thousand two hundred dollars nineteen cents. Supposing the capital of the Company and the bonds already created to be adequate to carry out the original design of the Company, of a railroad between Reading and the Delaware, with a branch to Philadelphia, including purchases of property and land damages, the above amount of one million and seventy-seven thousand two hundred dollars nineteen cents, with whatever may be required for an increased supply of locomotive power, cars, and carriages, will constitute the additional amount requisite to extend and put in operation the railroad to the coal region.

The cost of the upper portion of the railroad, it will be seen, is less, pro rata, than of that embraced in the original charter of the Company. The expenditure, it may therefore be reasonably anticipated, will be at least equally productive. That the whole expenditure of the Company, when the improvement shall have been fully completed to the coal mines, will be eminently so, the undersigned have never entertained any doubt. They have been induced, however, of late, for the satisfaction of others, to prepare some views and estimates, which, believing they may be interesting to the board, they beg leave respectfully to present.

Between Port Clinton and the dividing ground between the Schuylkill and Delaware, the graduation of the railroad, as the board are aware, varies between a level and a descent of from eighteen to nineteen feet per mile. The same holds of the portion of the railroad between Pottsville and Port Clinton, except for about two miles of the distance, on which a greater descent than that admitted below Port Clinton may be requisite. As at the point above named, near Philadelphia, where an ascending grade has been admitted, an assistant locomotive will be kept for the purpose of enabling engines to pass over it with their fullest loads, the maximum useful effect of locomotive power on the whole road will be preserved unimpaired.

It will be seen at once by those familiar with such subjects, that the railroad between Philadelphia and the coal region is without precedent, as it regards its particular aptitude for the trade it is to accommodate, and that inferences drawn from any other work, as to the results of locomotive power or the cost of transportation, are inapplicable to this.

That if a locomotive engine of twelve inch cylinder, and eighteen inch stroke, will transport sixty tons of freight on an undulating railroad, having ascents and descents of thirty feet per mile—the range of graduation almost universally admitted in America—it will, with at least equal ease, take down one hundred and fifty tons on a railroad generally descending, and the worst case on which is a level; that the useful effect of power is, therefore, two and a half times what it is on ordinary railroads, and that the wear and tear of locomotive engines and tenders *per ton, conveyed*, will be diminished in at least the same ratio.

And that in the case of the railroad in question, whilst the useful effect of the power employed is so much increased, the power itself is obtained at the minimum cost, the fuel used being had at its price at the mine, with the cost to the Company only superadded; thus reducing the cost of power per ton, the most essential item of expense in locomotive transportation, to not more than *one sixth* its ordinary cost.

The bearing of these features of the improvement of the Company on the cost of transportation, will be perceived in the accompanying estimates in the paper marked C. In the execution of the road, it has been the aim of the undersigned that the character of its superstructure should correspond, in some degree, with the graduation obtained for the roadway; and it is confidently believed that the resistance from friction will be found on the Philadelphia and Reading Railroad, reduced very nearly to the minimum attainable in practice. No account, however, is taken of this circumstance in the estimates; but the wear and tear, and consumption of coal and oil for each engine employed, are taken at the highest rates at which they have been found on the most imperfect roads. It will be seen, nevertheless, that the whole cost of transporting a ton of coal from Mount Corbon to Philadelphia, exclusive of interest on capital, will not exceed fifty-three cents, or $\frac{56}{100}$ths of a cent per ton per mile.

Presuming the cost of transporting other articles of freight to be *twice* that of coal, and of passengers to be *five fold*, the expense of transporting other tonnage from Mount Carbon to Philadelphia, would be one dollar and six cents per ton, (or for one half the distance, fifty-three cents,) and of passengers, estimating each passenger and his baggage at 224 lbs., $26\frac{1}{2}$ cents per passenger.

With these data as to *cost* of transportation, the inquiry next presents itself as to the trade and travel which will be commanded by the improvement, when completed, to the coal region. Supposing the charge of the Railroad Company for transportation of coal not to exceed the toll and freight on the canal, and the railroad to continue in use throughout the year, whilst the canal must necessarily be obstructed from four to five months, the former may reasonably be expected to obtain a fair proportion of the coal and other heavy trade, whilst it must command exclusively the light goods and travel. If, then, the coal trade of the Schuylkill should have reached only 800,000 tons by the time of the completion of the railroad, computing the travel and other trade on the most moderate scale, compared with that on other improvements similarly circumstanced, the following would present an exhibit of the nett receipts of the Company:—

400,000 tons of coal, at $2.25 per ton,	$900,000	
Deduct cost of transporting 400,000 tons, at 53 cents per ton,	212,000	$688,000
Passengers estimated as equal to 100 per day each way, or 73,000 per annum, at $4 each,	292,000	
Deduct cost to the Company of transporting 73,000 passengers, at 26½ cents each,	19,345	272,655
Freight on other articles than coal, estimated as equal to 100,000 tons, transported half the length of the road, at $2,	200,000	
Deduct cost of transporting 100,000 tons an average of 47 miles, at 53 cents per ton,	53,000	147,000
Add nett receipts from transportation of the mail,		18,000
Do. from wharf rents,		30,000
		$1,155,655
Deduct for repairs and renewals of railroad, including branch to Philadelphia, 96 miles, at $1200 per mile,	115,200	
For salaries of officers and agents, and hands engaged at depots and landings,	30,000	
For cost of keeping up assistant locomotive between Schuylkill and Delaware, including repairs and renewals,	6,000	151,000
Revenue of the Company,		$1,004,655

or a nett income, after the payment of all expenses, of twenty per cent. on a capital of $5,000,000.

If the above estimate should appear to the board a large one, the undersigned would only request that a minute and careful examination be made of its items. They are satisfied that the expenses of the Company, under each of the heads above given, are fully computed, and they cannot doubt that the anticipations as to trade and travel will be realised, if the Company, on the completion of the road to the coal region, should be fully prepared, in all respects, to accommodate it.

All which is respectfully submitted.

MONCURE ROBINSON. } *Engineers.*
WIRT ROBINSON,

Philadelphia, September 19*th*, 1838.

(A.)

Whole amount paid prior to the 1st of September, between Reading and Philadelphia, on construction account, including superintendence,	$1,529,591 09	
Paid for rails, chairs, &c. for this portion of the railroad,	257,600 00	
Whole amount disbursed between Reading and Philadelphia, ...		$1,787,191 09
Yet to be expended for this portion of the railroad, including building depot in Broad St.,	175,648 20	
Whole cost of constructing railroad between Reading and Broad street, . . .		1,962,839 29
Add estimated expense of level between the Schuylkill and Delaware, from report of 7th November last, . .	290,617 00	
Amount paid for locomotive engines, cars, and carriages,	122,851 65	

Whole cost of railroad to Delaware, including branch to Philadelphia, exclusive of purchases of property and damages of the road, . .	$2,376,307 94

(C.)

Estimate of the Cost of transporting Coal over the Philadelphia and Reading Railroad, from the Coal Region to Philadelphia.

The power of a locomotive engine, of 12 inch cylinder and 18 inch stroke, working under a pressure of from 70 to 80 pounds, and constructed with a view to heavy transportation, would be fully equal to the traction of 150 tons nett, at ten miles per hour on this road.

An engine, with her load, would perform the trip from the coal region to Philadelphia (94 miles) in one day, and return on the next, making the performance of each train employed by the Company, one hundred and fifty trips per annum.

To take down a load of 150 tons will require fifty cars, carrying three tons each.

Of course, to keep any given number of trains in motion, extra engines to the extent, perhaps, of one half the number in regular use, and extra cars to the extent probably of twice the number on the road, must be retained by the Company; but the expense of transporting any given number of tons, from the mines to the Delaware, will be no farther effected by this circumstance, than as the investment of the Company will be thereby increased, a larger dividend fund will of course be requisite to make the same a valuable one.

The cost of running an engine and train per annum will be as follows:—

Engineer's pay, $60 per month, ...	$720
Fireman's pay, $1.50 per day, ...	450
Fuel.—Five tons of coal per trip up and down, or 750 tons per annum, at $2.80, ...	2,100
Oil and grease estimated, equal to ten gallons of oil per trip, at 90 cents, . , ...	1,350

Wages of 5 men with train, at $1 per day,	1,500
Repairs and depreciation of engine and tender, and cars, estimated as equal to 25 per cent. of original cost, the first cost of engine and tender being estimated at $8,000, and cars at $300 each,	5,750
	$11,870

This amount, divided by 22,500, the number of tons of coal transported annually by each train, gives 52¾ cents per ton, as the cost of transportation of coal from the mines to Philadelphia.